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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
MANABU SUHARA ET AL	: EXAMINER: CANTELMO, G.
SERIAL NO: 10/089,109	:
FILED: MARCH 26, 2002	: GROUP ART UNIT: 1745

FOR: LITHIUM-COBALT COMPOSITE :
  OXIDE, METHOD FOR PREPARING
  THE SAME, POSITIVE ELECTRODE
  FOR LITHIUM SECONDARY CELL
  AND LITHIUM SECONDARY CELL
  USING THE SAME

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VA 22313

SIR:

This is an appeal of the Final Rejection dated January 14, 2005 of Claims 1, 2, 4 and

7-14. A Notice of Appeal is **submitted herewith**. (Also **submitted herewith** is an

amendment canceling Claims 5 and 6.)

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Seimi Chemical Co., Ltd. having an address

at 3-2-10, Chigasaki, Chigasaki-City, Kanagawa 253-8585, Japan.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1, 2, 4 and 7-14 stand rejected and are herein appealed. Claim 3, the remaining claim in the application, stands withdrawn as being directed to a non-elected species.

IV. STATUS OF THE AMENDMENTS

An amendment under 37 CFR 1.116, canceling Claims 5 and 6, is filed herewith.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

As recited in independent Claim 1, the present invention is a hexagonal lithium-cobalt composite oxide for a lithium secondary cell, which is represented by the formula $LiCo_{1-x}M_xO_2$, wherein x is $0 \leq x \leq 0.02$ and M is at least one member selected from the group consisting of Ta, Ti, Nb, Zr and Hf, and which has a half-width of the diffraction peak for (110) face at $2\theta = 66.5 \pm 1°$, of from 0.070 to 0.180°, as measured by the X-ray diffraction using CuK_α as a ray source.

See the specification at page 4, lines 14-21.

As recited in independent Claim 13, the present invention is also a hexagonal lithium-cobalt composite oxide for a lithium secondary cell, which is represented by the formula $LiCo_{1-x}M_xO_2$, wherein x is $0 < x \leq 0.02$ and M is at least one member selected from the group consisting of Ta, Ti, Nb, Zr and Hf, and which has a half-width of the diffraction peak for (110) face at $2\theta=66.5\pm1°$, of from 0.070 to 0.180°, as measured by the X-ray diffraction using CuK_α as a ray source.

Claim 13 is drawn to the elected species, i.e., x=0 is excluded from the definition of x.

VI. GROUNDS OF REJECTION

(A) Claims 1, 2 and 7-14 stand rejected as anticipated under 35 U.S.C. § 102(b) by, or in the alternative, as obvious under 35 U.S.C. § 103(a) over, JP-A-10-1316 (Aoki et al).

(B) Claim 4 stands rejected as unpatentable under 35 U.S.C. § 103(a) over Aoki et al in view of U.S. 5,709,969 (Yamahira).

(C) Claims 1, 2, 7 and 10-14 stand rejected as anticipated under 35 U.S.C. § 102(b) by, or in the alternative, as obvious under 35 U.S.C. § 103(a) over, U.S. 5,147,738 (Toyoguchi).

(D) Claim 4 stands rejected as unpatentable under 35 U.S.C. § 103(a) over Toyoguchi, in view of Yamahira.

(E) Claims 8 and 9 stand rejected as unpatentable under 35 U.S.C. § 103(a) over Toyoguchi in view of U.S. 5,702,843 (Mitate et al).

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(F) Claims 1, 2, 7, 10 and 12-14 stand provisionally rejected as unpatentable on grounds of obviousness-type double patenting over Claims 8-13 of copending Application No. 10/296,205 (copending application '205).

(G) Claim 4 stands provisionally rejected as unpatentable on grounds of obviousness-type double patenting over Claims 1 and 8-14 of copending application '205 in view of Yamahira.

(H) Claims 8, 9 and 11 stand provisionally rejected as unpatentable on grounds of obviousness-type double patenting over Claims 1 and 8-14 of copending application '205 in view of Aoki et al.

(I) Claims 12-14 stand provisionally rejected as unpatentable on grounds of obviousness-type double patenting over Claims 1 and 5 of copending Application No. 10/743,479 (copending application '479).

(J) Claims 1-11 stand provisionally rejected as claiming the same invention under 35 U.S.C. § 101 as that of Claims 1-11 of copending application '479.

VII. ARGUMENT

As a preface to the discussion of the grounds of rejection below, an Appeal Brief and a Reply Brief have already been filed in this application. The present Office Action contains only two new grounds of rejection to the Final Rejection (dated July 29, 2003) previously appealed from. The new grounds of rejection are reflected in Grounds of Rejection (I) and (J), *supra*, which are based on copending application '479. Copending application '479 is a continuation

of the present application, and the claims, by amendment filed December 23, 2003, are drawn

to subject matter found allowable in the present application in the Office Action dated July 29,

2003. Thus, as will be discussed *infra* with regard to Grounds of Rejection (I) and (J), the

claims of copending application '479 listed in the statement of the rejections are not the current

pending claims.

In addition, the present Final Rejection, without the addition of the above two new

grounds of rejection, and the Final Rejection dated July 29, 2003, are verbatim with regard to

grounds of rejection (A)-(H), except that the Examiner has added, with regard to each of

grounds of rejection (A)-(E), the following: "Arguments presented in the appeal brief are

discussed in the Examiner's Answer mailed December 23, 2003, incorporated herein." Thus,

the Examiner has not responded to any of the arguments made in the above-referenced Reply

Brief and thus, has not moved the prosecution forward.

Appellants now address the rejections on the merits. The following applies to all the

grounds of rejection.

The present invention relates to a lithium-cobalt composite oxide for a lithium

secondary cell, a process for its production, a positive electrode for a lithium secondary cell

employing it, and a lithium secondary cell.

As described in the specification under "Background Art," beginning at page 1, line 11,

lithium secondary cells employing a lithium-cobalt composite oxide ($LiCoO_2$) as a positive

electrode active material, are known. Also known are such composite oxides wherein some

amount of cobalt has been replaced with another element. Various processes for making such

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lithium-cobalt composite oxides are also known. One such process, as described in the specification at page 2, lines 6-12, and as disclosed in <u>Aoki et al</u>, *supra*, uses an active material $LiCoO_2$ which is obtained by dispersing in an aqueous lithium hydroxide solution, e.g., cobalt hydroxide or cobalt oxyhydroxide wherein the valence of cobalt is trivalent, followed by heat treatment, for the purpose of improving the cycle characteristics, etc., of a lithium secondary cell. Appellants further describe, at page 3, lines 10-17 of the specification, after discussing the prior art, that no product has been known which fully satisfies all of the requirements for cycle characteristics, the initial weight capacity density, the stability and the low temperature operation efficiency, and for a production method for efficient mass production.

As recited in Claim 1, the present invention is a hexagonal lithium-cobalt composite oxide for a lithium secondary cell, which is represented by the formula $LiCo_{1-x}M_xO_2$, wherein x is $0 \leq x \leq 0.02$ and M is at least one member selected from the group consisting of Ta, Ti, Nb, Zr and Hf, and which has a half-width of the diffraction peak for (110) face at $2\theta = 66.5 \pm 1°$, of from 0.070 to 0.180°, as measured by the X-ray diffraction using CuK_α as a ray source.

The Examiner has found that a process for producing the hexagonal lithium-cobalt composite oxide for a lithium secondary cell as defined in Claim 1 is patentable, as embodied in Claims 5 and 6 (which is the subject of copending application '479), discussed in greater detail *infra* with regard to Grounds of Rejection (I) and (J).

The specification herein contains data showing that the value of "x" in $LiCo_{1-x}M_xO_2$ affects the half-width of the diffraction peak for (110) face at $2\theta = 66.5 \pm 1°$. For example, Examples 15 and 16 each employ a value of x as 0.05, resulting in said half-width being higher

than the presently-recited maximum of 0.180°, and also resulting in a capacity retention after

40 charge/discharge cycles, less than that of the corresponding example compared to, i.e.,

Examples 1 and 5, respectively. Thus, Example 1 had a value of x of 0.002, and a capacity

retention after 40 charge/discharge cycles of 95.3%; that of Example 15 was 93.6%. Similarly,

Example 5 had a value for x of 0.002, and a capacity retention of 95.8%; the capacity retention

for Example 16 is 93.8%. In addition, the half-widths between Examples 1 and 15, and

between Examples 5 and 16, respectively, differ.

In addition, each of Examples 12, 13 and 14 demonstrates how the change of a

particular variable affects the results. Example 12 employs a cobalt oxide powder instead of

cobalt oxyhydroxide as in Example 9. Example 13 employs a cobalt oxyhydroxide powder

having a different average particle size and a different specific surface area compared to the

cobalt oxyhydride powder used in Example 9. Example 14 employs a lower firing temperature

than that used in Example 9. In all of these Examples 12-14, both the half-width and the

capacity retention changed.

The above-discussed results could not have been predicted by the applied prior art.

In addition, it is understood that in preparation of lithium cobaltate, the properties of

lithium cobaltate and characteristics of cells to be produced substantially depend on the types

of the starting materials, properties of the starting materials, mixing method (wet system or dry

system), and firing (sintering) temperature and atmosphere.

Ground (A)

Claims 1, 2 and 7-14 stand rejected under 35 U.S.C. § 102(b) as anticipated by, or in the

alternative, under 35 U.S.C. § 103(a) as obvious over, Aoki et al. That rejection is untenable

and should not be sustained.

In addition to the discussion above with regard to Aoki et al, Aoki et al disclose a

lithium-cobalt composite oxide having the formula $LiCo_{1-x}A_xO_y$, wherein x is between 0 and

0.25, and y is between 1.875 and 2.25. A can be, *inter alia*, Ti, Nb, Zr, Hf, and Ta. However,

Aoki et al do not exemplify any lithium-cobalt composite oxides within the terms of the present

claims, and moreover, do not recognize the effect the value of "x" has, both on the half-width

and the capacity retention. In addition, the above-discussed data in the specification shows that

how the lithium-cobalt composite oxide is made affects its physical properties and thus, affects

the make-up of the composite oxide itself.

The Examiner's rationale is that Aoki et al appears to disclose the claimed subject

matter, and that the burden is on Appellants to show that the claimed subject matter is different

from, and not suggested by, Aoki et al, relying on *In re Best*, 562 F.2d 1252, 195 USPQ 430

(CCPA 1977).

In reply, Appellants do not dispute the indication in *Best* that the PTO can require a

patent applicant to prove, where claimed subject matter is **reasonably** considered to be

inherently or necessarily met by the prior art, that the claimed subject matter is not met by the

prior art (emphasis added). However, Appellants have demonstrated with the data of record

that it is not reasonable to presume that Aoki et al meets, or otherwise suggests, the

presently-claimed invention. Indeed, the CCPA in *Best* confirmed that indirect comparisons, based on established scientific principles, can validly be applied to distinguish a claimed chemical product from that disclosed in the prior art. *Best*, 195 USPQ at 432. While Appellants have not directly compared to Aoki et al, all the evidence of record, which shows the influence of many variables on the half-width of the diffraction peak, including the starting materials used, clearly suggest that Aoki et al's product does not meet the terms of the present claims.

Claim 2

Claim 2 is separately patentable, because Aoki et al neither disclose nor suggest the hexagonal lithium-cobalt composite oxide of Claim 1, wherein x is $0.0005 \leq x \leq 0.02$, and the half-width of the diffraction peak for (110) face is from 0.100 to 0.165°. Aoki et al is silent with regard to half-width of the diffraction peak for (110) face generally.

Claim 12

Claim 12 is separately patentable, because Aoki et al neither disclose nor suggest the hexagonal lithium-cobalt composite oxide for a lithium secondary cell according to Claim 1, which is obtained by a process which comprises dry blending a cobalt oxyhydroxide powder having an average particle size of from 1 to 20 μm and a specific surface area of from 2 to 200 m^2/g, a lithium carbonate powder having an average particle size of from 1 to 50 μm and a specific surface area of from 0.1 to 10 m^2/g, and a powder of an oxide of metal element M

having an average particle size of at most 10 μm and a specific surface area of from 1 to 100

m^2/gm, and firing the mixture at a temperature of from 850 to 1,000°C in an oxygen-containing

atmosphere.

As stated above, the Examiner has found that the recited process in Claim 12 is

patentable.

In addition, and as discussed above, Appellants have shown that the process of making

affects the product formed, and thus its properties.

Claim 14

Similarly, Claim 14 is patentable, because Aoki et al neither disclose nor suggest the

hexagonal lithium-cobalt composite oxide according to Claim 13, which is obtained by a

process which comprises dry blending a cobalt oxyhydroxide powder having an average

particle size of from 1 to 20 μm and a specific surface area of from 2 to 200 m^2/g, a lithium

carbonate powder having an average particle size of from 1 to 50 μm and a specific surface area

of from 0.1 to 10 m^2/g, and a powder of an oxide of metal element M having an average particle

size of at most 10 μm and a specific surface area of from 1 to 100 m^2/gm, and firing the mixture

at a temperature of from 850 to 1,000°C in an oxygen-containing atmosphere.

As stated above, the Examiner has found that the recited process in Claim 14 is

patentable.

In addition, and as discussed above, Appellants have shown that the process of making

affects the product formed, and thus its properties.

For all the above reasons, it is respectfully requested that this rejection be REVERSED.

Ground (B)

Claim 4 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Aoki et al in view of Yamahira. That rejection is untenable and should not be sustained.

The Examiner relies on Yamahira for a disclosure of volumetric density, and specifically one having a range of from 2.0 to 4.3 g/ml (paragraph bridging columns 3 and 4). In Yamahira, a mixture of a lithium compound and a cobalt compound is compression molded, and then sintered to prepare a sintered compact pellet, and this pellet is as itself used as a positive electrode for e.g. a coin-shaped cell. In Yamahira, the volumetric density of the sintered compact pellet is from 2.0 to 4.3 g/ml. Accordingly, Yamahira is fundamentally different from the present invention in the method for producing the positive electrode material and the method for using the positive electrode material. In the present invention, a mixture is not pelletized and no sintered molded body is prepared. In the present invention, the press density of a sintered powder is defined. Nevertheless, even if the products of Aoki et al were to have the volumetric density of Yamahira, the result would still not be the presently-claimed invention, because Yamahira does not remedy the above-discussed basic deficiencies of Aoki et al.

In the Final Rejection, the Examiner finds that Appellants have failed to "persuasively argue why it would not have been obvious to modify the primary reference in view of Yamahira." In reply, Aoki et al is not drawn to a sintered compact pellet which itself is used as

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a positive electrode. Thus, the volumeric density of Yamahira's sintered compact pellet has no

relevance to the lithium-cobalt composite oxide of Aoki et al. Nor has the Examiner shown

that packing press density is a result effective variable. Thus, *In re Antonie*, 559 F.2d 618, 195

USPQ 6, 8-9 (CCPA 1977) applies (exceptions to rule that optimization of a result-effective

variable is obvious, such as where the results of optimizing the variable are unexpectedly good

or where the variable was not recognized to be result effective). Appellants are entitled to

prevail under at least the second of the above exceptions.

Accordingly, it is respectfully requested that this rejection be REVERSED.

Ground (C)

Claims 1, 2, 7 and 10-14 stand rejected under 35 U.S.C. § 102(b) as anticipated by or,

in the alternative, under 35 U.S.C. § 103(a) as obvious over, Toyoguchi. That rejection is

untenable and should not be sustained.

Toyoguchi discloses a cathode active material having the following formula:

$$Li_xCo_{(1-Y)}M_YO_2 \ (M=W, \ Mn, \ Ta, \ Ti, \ Nb),$$
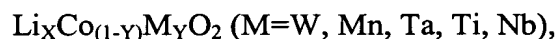
which is prepared by mixing Li_2CO_3, $CoCO_3$ and at least one oxide of W, Mn, Ta, Ti, Nb at

predetermined ratio (Li atom = X mole, Co atom = 1-Y mole, M atom = Y mole), wherein

$0.05 \le Y \le 0.35$, followed by heating the mixture at 900°C for 10 hours (column 1, lines 48-63

and column 2, lines 54-61). In each of Tables 1-5 therein, Toyoguchi exemplifies cathode

active materials of the above formula wherein, *inter alia*, X is 1, and Y is 0.02 (which examples

are thus outside the scope of Toyoguchi's invention). However, since Toyoguchi discloses

preparing their cathode active material with starting materials different from the present

starting materials, and in view of the above-discussed comparative data, it would not be

expected that the cathode active material of Toyoguchi would be the same as, or have the same

properties as, the presently-claimed lithium-cobalt composite oxide. Note also that when Y is

within the terms of Toyoguchi's invention, i.e., above 0.05, discharge capacity per unit weight

tends to decrease.

It is clear that the Examiner's rationale for this rejection is the same as that for the

rejection over Aoki et al, discussed under Ground (A), above. The points made therein in

rebuttal apply herein as well.

Claims 2, 12 and 14

In addition, the various claims that were argued separately under Ground (A) are

separately patentable herein as well, for the same reasons as discussed under Ground (A),

except that Toyoguchi applies herein rather than Aoki et al.

For all the above reasons, it is respectfully requested that this rejection be REVERSED.

Ground (D)

Claim 4 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Toyoguchi in

view of Yamahira. That rejection is untenable and should not be sustained.

See the discussion under Ground (B) regarding the Examiner's reliance on Yamahira.

Nevertheless, even if the products of Toyoguchi were to have the volumetric density of

Yamahira, the result would still not be the presently-claimed invention, because Yamahira does not remedy the above-discussed basic deficiencies of Toyoguchi.

In the Final Rejection, it is clear that the Examiner's rationale for this rejection is the same as that for the rejection over Aoki et al, discussed under Ground (B), above. The points made therein in rebuttal apply herein as well, except that Toyoguchi applies herein rather than Aoki et al.

Accordingly, it is respectfully requested that this rejection be REVERSED.

Ground (E)

Claims 8 and 9 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Toyoguchi in view of Mitate et al. That rejection is untenable and should not be sustained.

The Examiner relies on Mitate et al for a disclosure of a current collector supporting an electrode. But even if a current collector were used in the cathode active material of Toyoguchi, Mitate et al would still not remedy the basic deficiencies of Toyoguchi, as discussed above.

Accordingly, it is respectfully requested that this rejection be REVERSED.

Ground (F)

Claims 1, 2, 7, 10 and 12-14 stand provisionally rejected on grounds of obviousness-type double patenting over Claims 8-13 of copending application '205. That rejection is untenable and should not be sustained. Each of Claims 8-13 of copending application '205 depends on Claim 1 thereof, which reads as follows:

A lithium-transition metal composite oxide which comprises particles of a lithium composite oxide represented by the formula $Li_xM_{1-y}N_yO_2$, wherein $0.2 \leq x \leq 1.2$, $0 \leq y \leq 0.7$, M is a transition metal element, and N is a transition metal element other than M or an alkaline earth metal element, wherein in the distribution curve of the cumulative volume particle size of said lithium composite oxide, the inclination of the curve at a cumulative volume fraction of 20% is at most $9\%/\mu m$, the inclination of the curve at the cumulative volume fraction of 80% is at least $3\%/\mu m$, and the average particle size is from 3 to 20 μm.

Thus, the claimed subject matter in copending application '205 requires particular values of the inclination of the distribution curve of the cumulative volume particle size of the lithium composite oxide, one at a cumulative volume fraction of 20%, and one at a cumulative volume fraction of 80%. There are other differences as well. The subject matter of the present claims has no such requirement. The Examiner has no basis to conclude that the presently-claimed subject matter inherently or necessarily meets the two inclination limitations of the claims of copending application '205.

Accordingly, it is respectfully requested that this rejection be REVERSED.

Ground (G)

Claim 4 stands provisionally rejected on grounds of obviousness-type double patenting over Claims 1 and 8-14 of copending application '205 in view of <u>Yamahira</u>. That rejection is untenable and should not be sustained.

Each of Claims 8-14 of the copending application depends on Claim 1 thereof, set forth under Ground (F), above.

<u>Yamahira</u> does not remedy any of the deficiencies discussed above under Ground (F).

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In the Final Rejection, it is clear that the Examiner's rationale for this rejection is the same as that for the rejection over <u>Aoki et al</u>, discussed under Ground (B), above, and as that for the rejection over <u>Toyoguchi</u>, discussed under Ground (D), above. The points made therein in rebuttal apply herein as well, except that Claims 1 and 8-14 of the copending application apply herein rather than <u>Aoki et al</u> and <u>Toyoguchi</u>.

Accordingly, it is respectfully requested that this rejection be REVERSED.

Ground (H)

Claims 8, 9, and 11 stand provisionally rejected on grounds of obviousness-type double patenting over Claims 1 and 8-14 of copending application '205 in view of <u>Aoki et al</u>. That rejection is untenable and should not be sustained.

<u>Aoki et al</u> does not remedy any of the deficiencies discussed above under Ground (F).

Accordingly, it is respectfully requested that this rejection be REVERSED.

Ground (I)

Claims 12-14 stand provisionally rejected on grounds of obviousness-type double patenting over Claims 1 and 5 of copending application '479. Claim 1 has been cancelled in copending application '479. In addition, all the claims therein are limited to a process, found to be allowable in this application. Accordingly, it is respectfully requested that this rejection be REVERSED.

Ground (J)

Claims 1-11 stand provisionally rejected under 35 U.S.C. § 101 as claiming the same

invention as that of Claims 1-11 of copending application '479. Claims 5 and 6 have been

cancelled from the present application. The claims are now all drawn to a product. Claims 1

and 7-11 have been cancelled in copending application '479. In addition, all the claims therein

are limited to a process, found to be allowable in this application. Accordingly, it is

respectfully requested that this rejection be REVERSED.

The arguments made in the above-referenced Reply Brief are now repeated. Since the

Examiner has incorporated the above-referenced Examiner's Answer, reference to the

Examiner's Answer (Answer) remain.

The Answer, and thus the present Final Rejection, in essence, ignores one of the main

points raised in the previous and present Appeal Brief, i.e., that the comparative data of record

shows that the value of "x" affects the half-width of the diffraction peak for (110) face at

$2\theta=66.5\pm1°$ (half-width), that the half-width affects the capacity retention after 40

charge/discharge cycles, and that the process of making the claimed hexagonal lithium-cobalt

composite oxide affects these properties, even when "x" is within the terms of the present

claims. Nor has the Examiner responded to Appellants' argument regarding *In re Best*, 562

F.2d 1252, 195 USPQ 430 (CCPA 1977) to the extent that Appellants have demonstrated with

the data of record that it is not reasonable to presume that Aoki et al or Toyoguchi meet, or

otherwise suggest, the presently-claimed invention. In essence, the Examiner's whole case is

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based on the fact (1) that Aoki et al discloses an *empirical* formula for a lithium-cobalt-metal oxide wherein the variable corresponding to the presently-recited "x" broadly encompasses the presently-recited range of $0 \leq x \leq 0.02$ (Answer at 19) and (2) that Toyoguchi et al discloses **comparative examples** having an *empirical* formula for a lithium-cobalt-metal oxide wherein the variable corresponding to the presently-recited "x" is within the presently-recited range of $0 \leq x \leq 0.02$, although the **invention** of Toyoguchi et al has an *empirical* formula for a lithium-cobalt-metal oxide wherein the variable corresponding to the presently-recited "x" is actually outside the presently-recited range (Answer at 25-26).

In making this analysis, the Examiner ignores other limitations in the claims, i.e., such as the recited half-width range, and the point, raised above, that the method of making the recited hexagonal lithium-cobalt composite oxide affects both the half-width and the physical properties of the composite oxide.

The Examiner dismisses the comparative data of record because it is not a side-by-side comparison with Aoki et al (Answer at 20) or Toyoguchi (Answer at 26). In reply, and as pointed out in the previous and present Appeal Brief, *Best* confirms that indirect comparisons, based on established scientific principles, can validly be applied to distinguish a claimed chemical product from that disclosed in the prior art. See also, *In re Blondell*, 499 F.2d 1311, 182 USPQ 294, 298 (CCPA 1974), *In re Fouche*, 439 F.2d 1237, 169 USPQ 429, 433 (CCPA 1971), and *In re Wilder*, 429 F.2d 447, 166 USPQ 545, 549 (CCPA 1970).

In response to Appellants' arguments in the previous Appeal Brief that Aoki et al does not exemplify any lithium-cobalt composite oxides within the terms of the present claims, the

Examiner finds that <u>Aoki et al</u> do, at paragraph [0013] (Answer at 19). While paragraph [0013] does *list* empirical formulae, wherein x is between 0 and 0.02, none of the listed compounds have an empirical formula within the terms of the empirical formula of the present claims. At any rate, mere listing of a compound is not an example thereof, and indeed, <u>Aoki et al</u> make no distinction between any value of x between 0 and 0.25.

The Examiner improperly relies on Appellants' disclosure at page 4, line 26 through page 6, line 4 as, in effect, disclosing that as long as x is between 0 and 0.02, "the claimed characteristics will be achieved" (Answer at 20 and 26).

In reply, while Appellants may disclose that x within the above range is a necessary condition, it is not a sufficient condition since, as also disclosed therein, the half-width must also be satisfied. This is addressed neither by the Examiner nor by the applied prior art.

With regard to the various rejections of Claim 4 and the application of <u>Yamahira</u>, Appellants maintain that <u>Yamahira</u>'s disclosure of volumetric density is specific to <u>Yamahira</u>'s sintered compact pellet and has no relevance to the lithium-cobalt composite oxide of <u>Aoki et al</u>, or the cathode active material of <u>Toyoguchi</u>.

Regarding the obviousness-type double patenting rejections discussed as Issues (F), (G) and (H) in the previous Appeal Brief, the Examiner has not responded to the particular arguments made in the Appeal Brief at pages 11-13. The Examiner finds that the subject matter of the present claims and the product claimed in copending application '205 are identical and that there is a reasonable expectation that the subject matter of copending application '205 will have the same characteristics as recited in the present claims (Answer at 32-33). In reply, it is

the Examiner's burden to demonstrate identity and reasonable expectation, in the first instance,

not Appellants' burden to demonstrate that the products are not identical and that there is no

reasonable expectation. Nevertheless, Appellants have so demonstrated this, in the

above-referenced arguments in the previous and present Appeal Brief.

VIII. CONCLUSION

For the above reasons, it is respectfully requested that all the rejections still pending in

the Final Rejection be REVERSED.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon

Harris A. Pitlick
Registration No. 38,779

Customer Number

22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/03)
NFO/HAP/cja

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CLAIMS APPENDIX

1. A hexagonal lithium-cobalt composite oxide for a lithium secondary cell, which is represented by the formula $LiCo_{1-x}M_xO_2$, wherein x is $0 \leq x \leq 0.02$ and M is at least one member selected from the group consisting of Ta, Ti, Nb, Zr and Hf, and which has a half-width of the diffraction peak for (110) face at $2\theta = 66.5 \pm 1°$, of from 0.070 to 0.180°, as measured by the X-ray diffraction using CuK_α as a ray source.

2. The hexagonal lithium-cobalt composite oxide for a lithium secondary cell according to Claim 1, wherein x is $0.0005 \leq x \leq 0.02$, and the half-width of the diffraction peak for (110) face is from 0.100 to 0.165°.

4. The hexagonal lithium-cobalt composite oxide for a lithium secondary cell according to Claim 1, wherein the packing press density of the hexagonal lithium-cobalt composite oxide is from 2.90 to 3.35 g/cm^3.

7. A positive electrode for a lithium secondary cell, which contains the hexagonal lithium-cobalt composite oxide for a lithium secondary cell as defined in Claim 1, as an active material.

8. The positive electrode for a lithium secondary cell according to Claim 7, having a mixture comprising the active material, an electrically conductive material and a binder, supported on a current collector.

9. The positive electrode for a lithium secondary cell according to Claim 8, wherein the current collector is aluminum or stainless steel.

10. A lithium secondary cell employing a positive electrode which contains the hexagonal lithium-cobalt composite oxide for a lithium secondary cell as defined in Claim 1, as an active material.

11. The lithium secondary cell according to Claim 10, wherein a cyclic or chain carbonic ester is used as a solvent for the electrolyte.

12. The hexagonal lithium-cobalt composite oxide for a lithium secondary cell according to Claim 1, which is obtained by a process which comprises dry blending a cobalt oxyhydroxide powder having an average particle size of from 1 to 20 μm and a specific surface area of from 2 to 200 m^2/g, a lithium carbonate powder having an average particle size of from 1 to 50 μm and a specific surface area of from 0.1 to 10 m^2/g, and a powder of an oxide of metal element M having an average particle size of at most 10 μm and a specific surface area of from 1 to 100 m^2/gm, and firing the mixture at a temperature of from 850 to 1,000°C in an oxygen-containing atmosphere.

13. A hexagonal lithium-cobalt composite oxide for a lithium secondary cell, which is represented by the formula $LiCo_{1-x}M_xO_2$, wherein x is $0 < x \leqq 0.02$ and M is at least one member selected from the group consisting of Ta, Ti, Nb, Zr and Hf, and which has a half-width of the diffraction peak for (110) face at 2 θ=66.5$\pm$1°, of from 0.070 to 0.180°, as measured by the X-ray diffraction using CuK$_\alpha$ as a ray source.

14. The hexagonal lithium-cobalt composite oxide for a lithium secondary cell according to Claim 13, which is obtained by a process which comprises dry blending a cobalt oxyhydroxide powder having an average particle size of from 1 to 20 μm and a specific surface

area of from 2 to 200 m^2/g, a lithium carbonate powder having an average particle size of from 1 to 50 μm and a specific surface area of from 0.1 to 10 m^2/g, and a powder of an oxide of metal element M having an average particle size of at most 10 μm and a specific surface area of from 1 to 100 m^2/gm, and firing the mixture at a temperature of from 850 to 1,000°C in an oxygen-containing atmosphere.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.